A REVISION OF CLUSIA L. SECTION COCHLANTHERA (CHOISY) ENGLER

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At an earlier time I published (Maguire, 1958) a review of the Section *Cochlanthera* of the genus *Clusia* L., admitting there five species. Now, after further field work in Colombia, I present an updated revision of the section with the addition of two new species, bringing the total to seven.

The history of section *Cochlanthera* was briefly reviewed by me (l c, 1958) and does not require repetition here. But some further observation on the anatomy, especially on the extraordinary androecial morphology, and comment on the nature of the ovary are required.

So unique is the cochlearform * character of the stamens that early the type species of the section was three times placed in the segregate genus *Cochlanthera* (Choisy, 1851; Planchon & Triana, 1860; and Vesque, 1893), and two times placed in the genus *Clusia* as the section *Cochlanthera* (Vesque, 1892; Engler, 1925). I recently (Maguire, 1958) considered the plant in question best referable to the genus *Clusia* in the section *Cochlanthera,* as set up by Engler (l c), and I retain that view now.

This ambivalence is easily understood because the cochlearform anthers of the male flower are found in no other section of *Clusia,* but at the same time hold the seven members of the section in a neatly circumscribed and natural alliance. In American clusioids, such anthers, at least in external appearance, are found only in the somewhat remotely related genus *Tovomita.* In other characteristics, dioecism, latex, leaf form, fruit form, placentation, and embryo form, all seven members of the section are typically *Clusia.*

Habit: Two species of section *Cochlanthera,* according to notes of the collectors, are epiphytic, viz, *C. cochlanthera,* observed by Steyermark, and *C. centricupula,* observed by Cuatrecasas (both so indicated on herbarium specimen labels). The other five species, observed in the field and collected by me, are terrestrial and trees, in some instances reaching 30 meters in height and 50 centimeters in diameter. *C. orthoneura* is facultatively terrestrial or epiphytic.

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* Often spelled "cochleariform".

Latex: Latex in all species is evidently copious or moderately so. In the subsection *Cochlanthera* the latex varies from cream-colored to bright orange *(C. lunanthera)*. In the subsection *Orthoneura* the latex is cream-white.

Leaves: Leaf blades are specifically distinguishable in form and texture. Petioles provide dependable secondary characters.

Inflorescence: Cymose, few-flowered, determinate, therefore terminal. Bracts inconspicuous.

Calyx: Characteristically the first and second pairs of sepals are decussate, the remaining 5-7 are subpetaloid, whitish and imbricate. The various arrangements, however, appear to be constant within a species.

Petals: White, large, showy, multiveined, suberosely margined, broadly obovate or panduriform. Petal form and size seem to be relatively constant within the species.

Androecium: It is the structure of the androecium that forms the basis for subsectional segregation within this close-knit assemblage of species. The androecium of the subsection *Cochlanthera,* of four species, viz, *cochlanthera, lunanthera, centricupula* and *cochlitheca,* is seated on a flat or slightly convex receptacle, the stamens of which are peripherally arranged in 2-several-series. In all instances the filaments are slender and the anthers cochlearform and extrorsely positioned. The center of the disc is beset with stout, prismatic, relatively short staminodia which are coalesced basally. Characteristically, the staminodial mass is covered by a viscid secretion (latex?). The anthers are 4-thecate, dehiscing lengthwise in conformation with the recurved posture.

The three species of the subsection *Orthoneura,* viz, *orthoneura, celiae* and *cochliformis,* are deficient in the presence of central staminodia or, indeed, in the androecium, of staminodia of any character. The stout filaments are borne en the summit of a prominent, conic, or massive cupuliform, often 5-angled androphore with a distinct cylindric internally central well or pit reaching to the base. Anthers are similar to those of the subseet *Cochlanthera.*

Anthers are here termed "extrorse", *sic* the stamens. The position of the stamens has not been verified by examination of the orientation of the single vascular bundle. As I have interpreted the morphology of the anther, the distally inwardly curved tip is the apex; the outwardly curved terminus is basal. The connective extends closely or essentially to the apex of the anther.

It should be pointed out here that these three closely related but very distinct species geographically are confined to the proximal Departments of Cundinamarca, Boyacá, Santander and Norte de Santander, Colombia.

Pistil: Evolutionary development of the gynoecial apparatus evidently has proceeded independently of progressive androecial change. At least the development of the five, six and eight carpellary state cuts across the two lines of androecial morphologic development. We have in this respect given heavier weight to androecial modification, and thus have used this latter conspicuous and readily observed attribute as the basis for the establishment of subsectional delimitation.

Besides the numerical sequence of carpellary numbers, we find other intriguing conditions of ovary, placentation, ovule, seed, and stigma organization of great interest. However, detailed consideration of these structures cannot be developed in this paper.

Ovary - Placentation: In the genus *Clusia,* the number of carpels varies from four (4) to more than twenty (20), the number usually being more or less constant for a given species. Ovules usually are numerous (except in some apomictic forms). As the fleshy latex-permeated fruit matures and the capsule dehisces and the valves open widely, some region in the "dissepiment" breaks down or otherwise separates, leaving the stellate or radially-winged, free, sometimes shortened, central axis which is erect in the open fruit. Attachment of the ovules is on the "dissepiment", not in the central angle of the axis, and placentation may rarely extend to and actually occur on the peripheral endocarp wall. The copious cream, yellow, or orange to red arillar chain-like tissue originates from the funiculus. Ovules and seed (except in apomictic forms) are complex. Apomixis is not known to occur in the section *Cochlanthera.*

	Carpel Numbers	Geography
Subsection *Cochlanthera*		
Clusia cochlanthera	5	Venezuelan coast
Clusia centricupula	8	Colombian Pacific coast
Clusia lunanthera	8	Tafelberg, Suriname
Clusia cochlitheca	8	Huachamacari - Perú, Amazonian Venezuela
Subsection *Orthoneura*		
Clusia orthoneura	6	Eastern Cordillera - Colombia
Clusia celiae	5	" " "
Clusia cochliformis	5	" " "

Geography: The indicated distribution of the seven now known species of the section *Cochlanthera* is interesting and instructive. As shown by the distribution map, each of the seven species occupies a restricted range, but with those assigned to the subsection *Cochlanthera* widely continentally disjunct and each occupying a closely limited range. The three members of the subsection *Orthoneura* occupy proximal but exclusively discrete small ranges at the lower and middle altitudes of the eastern Cordillera of Colombia. As indicated in my earlier review of the section (Maguire, 1958), this distribution suggests a relictual status for the disparate species and, historically, a primary or early position for the section.

Over the past years duplicate specimens of the collections cited herein have been sent variously to: F, G, GH, IAN, K, MO, P, S, U, US and VEN. Especially, now, I wish to express appreciation to our colleagues of the Instituto de Ciencias Naturales in Bogotá for the generous assistance given my field work carried out in Colombia in 1970: to Doctors Idrobo, Fernández and García-Barriga. Specimens of all recently collected materials are at COL.

Further, I wish to express appreciation to Yung-chau Huang, who expertly prepared the SEM micrographs; to Charles C. Clare, Jr., who prepared the excellent diagnostic drawings; and to Celia Maguire, co-collector and co-student in the field, and careful preparator of the typescript.

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TAXONOMIC REVIEW

Clusia L. section Cochlanthera (Choisy) Engler, in E. & P. Pflanzenf. ed. 2. 21: 202. 1925; emend Maguire, Mem. N. Y. Bot. Gard. 10 (1): 58. 1958, *et hic.*

Sepals 6-8, the lower decussate, and more often the upper petaloid and imbricate; petals 6-8, showy; functional stamens 15 - ∞, extrorse, 1-several-seriate, disposed on a flat disc or elevated on an elevated cylindric androphore; staminodes central or absent in the staminate flower; anthers cochlearform, extrorse, 4-thecate, dehiscing lengthwise medianly along the convex face; pollens small (± 20 μ), 3-colporate, sphaeroidal, the exine pitted (foveolate, in one species punctitegillate); staminodia of pistillate flowers forming a continuous or discontinuous 1-3-serial narrow ring; ovary 5-6-8-locular; ovules numerous; stigmas 5-6-8.

Trees or epiphytes; leaf petioles slender or broadly winged; blades subchartaceous to coriaceous; latex white, yellow or orange. Confined to continental South America north of the equator, the seven species broadly disjunct and each narrowly endemic.

Key to the Species of *Clusia*, Section *Cochlanthera*.

1. Receptacle of ♂ flowers shallowly discoid; stamens 2-several-seriate; staminodes stout, prismatic, somewhat coalesced at the base, forming a

glutinous mass in the center of the disc; latex cream to orange; petioles slender; ovary 5-8-celled; Subsect *Cochlanthera.*

2. Stamens fewer than 50; plants epiphytic.

3. Leaf blades elliptic-lanceolate, 10 cm or less long; petioles slender, 1.5-2.5 cm long; calyx of 2 decussate pairs and commonly 5 imbricate sepals; petals ca 2.5 cm long, white; stamens ± 20; fruit narrowly elliptic-oblong, to 5 cm long, 5-celled; stigmas 5, rotate, somewhat stalked; apparently confined to the coastal mountains of Venezuela.

1. *Clusia cochlanthera* Vesque.

3. Leaf blades obovate-lanceolate, commonly 8-15 cm long; petioles broadly winged, 1.0-1.5 cm long; calyx of 7 imbricate sepals; petals rose-colored; stamens 30-40; fruit 8-celled; stigmas 8, sessile; known only from the Río Naya, Pacific coast of Colombia.

2. *Clusia centricupula* Cuatrecasas.

2. Stamens ± 100; terrestrial, trees.

4. Branchlets terete; leaf blades 12-20 cm long, oblanceolate to oblanceolate-elliptic, the apex acute or abruptly acuminate; sepals 7, the lower pair decussate, the upper 5 imbricate; petals 8, obovate, 6-7 cm long, white; ovary 8-locular; stigmas 8, sessile; known only from Tafelberg, Suriname.

3. *Clusia lunanthera* Maguire.

4. Branchlets sharply angled; leaf blades 18-25 cm long, broadly elliptic to elliptic-oblanceolate, apex obtuse to acutish; sepals 8-10, the 4 lowermost paired and decussate, the upper imbricate; petals panduriform, 3-6 cm long; ovary 8-locular; stigmas umbraculiform; Roraima sandstone mountains of Amazonas, Venezuela.

4. *Clusia cochlitheca* Maguire.

1. Receptable of ♂ flowers provided with a prominent corniform pentangular androphore upon which filaments are mounted; ovary 5-celled; latex cream-colored to orange; Subsect *Orthoneura.*

5. Leaf blades narrowly elliptic-oblanceolate, 8-10 cm long; veins ascending at 75-80° angle; petioles slender, not winged; sepals 4-6, of 2-3 decussate pairs; petals 5, obovate, ca 3 cm long; stamens fewer than 20; ovary 6-locular; fruit somewhat ovate to somewhat obovate, 7-8 cm long, 5-6 cm broad, somewhat 6-

angled; stigmas sessile, acutely obovate, 7-8 mm long, marginally subconnivent; Departamentos Boyacá and Cundinamarca, Colombia.

5. *Clusia orthoneura* Standley.

5. Leaf blades much exceeding 10 cm in length; veins ascending at 45-55° angles; petioles broad, more or less winged; sepals exceeding 6, the lower paired and decussate, the upper imbricate; stamens exceeding 20; ovary 5-locular.

6. Leaf blades broadly obovate, commonly 15-20 cm long; sepals commonly 10, the lower 6 paired and decussate, the upper imbricate; petals 5-6 cm long, 7-8 cm broad; stamens 30-40, 3-serial; stigmas 5, short-cornute; Departamento Santander, Colombia.

6. *Clusia celiae* Maguire.

6. Leaf blades oblanceolate, commonly 12-15 cm long; sepals 6, in 3 decussate pairs; petals ca 4 cm long, 5 cm broad; androphore depressed-globose; stamens about 20, 2-serial; stigmas 5, sessile; Departamento Santander del Norte, Colombia.

7. *Clusia cochliformis* Maguire.

1. **Clusia cochlanthera** Vesque, Epharmosis 3: pl. 67. 1892; emend Maguire, Mem. N. Y. Bot. Gard. 10 (1): 59. 1958.

Cochlanthera lanceolata Choisy, Mem. Soc. Phys. Genév. 12: 426. pl. 3. 1851; not *Clusia lanceolata* Cambess. in St.-Hil. pl. Bras. Mer. 1: 318. 1825; Vesque in DC. Monogr. 8: 141. 1893.

Epiphyte, latex cream-colored; blades elliptic-oblanceolate, ± chartaceous, base acute, apex acuminate, commonly 10-15 (20 in litt) cm long, 3-5 cm broad, veins ascending at 40-50°; petioles slender, commonly 2.5 cm long; staminate flowers: sepals ± 10, lowermost paired (2) and decussate, upper imbricate, petaloid; petals 5, broadly obovate, 20-24 mm long, margins suberose; stamens 15-20, filaments 2-seriate, ca 6-8 mm. long, anthers cochlearform, extrorse, 4-celled, ca 2 mm long; staminodes 6-10, prismatic, 2-3 mm long, agglutinous, forming a central discoid mass; pistillate flowers unavailable; fruit narrowly elliptic, 4-5 cm long, 5-locular, stigmas cornute-peltate, radiate, ca 4 mm diam.

TYPE. At 4.000 ft. alt, Puerto Cabello, Estado Carabobo, Venezuela, Jun 1846, *Funck & Schlim 714* (holotype Herb. Boissier, G.).

Distribution. VENEZUELA. Estado Carabobo: 4.000 ft alt, Puerto Cabello, Jun 1846, *Funck & Schlim 714* (holotype G, Herb. Boissier, isotype Herb. Delessert G.). Estado Sucre, Península de Paría: ♀ tree 15 m high, epiphyte, petals white, leaves subcoriaceous, dark green above, paler green below; fruit pale green; latex creamy; at 1.060 m alt, Cerro de Humo, arriba de Boca de Cumaná y Punto Siparo, noroeste de Irapa, 1 Mar 1966, *Steyermark 94829;* ♂ tree, epiphyte, leaves coriaceous, deep green above, paler green below, 1.060 m alt, locality as 94829, 1 Mar 1966, *Steyermark 94838.*

Recently Dr. Steyermark has made the two collections of an epiphytic *Clusia* on the Península of París, cited above, which almost certainly are referable to *C. cochlanthera.* The description derives from the literature supplemented by Dr. Steyermark's specimens. Subsequent collections from the type locality, i e, above Puerto Cabello, Estado Carabobo, Venezuela, have not been made.

2. **Clusia centricupula** Cuatrecasas, Rev. Acad. Col. Cienc. Exactas, Físicas y Nat. VIII: 56. 1950, ex descr.

Epiphyte with terete branchlets; leaf blades ovate-lanceolate, 6.5-15.5 cm long, 3.2-7.5 cm broad, apex attenuate-acutish, base minutely drawn into a broadly winged petiole, 10-15 mm long, midrib thick; inflorescence terminal, few-flowered; male flowers known only by buds (acc auth); stamens 30-40, disposed in 3-series; staminodes forming a thick resinous cupuliform mass; pistillate flowers: sepals 7, imbricate, membranous, rose-colored, the exterior 2 subopposite; petals 5, obovate-orbicular with an ungulate base; staminodia forming a coriaceous cup 5 mm high; ovary ovate-elliptic, ca 8 mm high; stigmas 8, elliptic, sessile, petasiform.

Type. Arbol epífito, flor rosada, bosque 5-20 m alt, Río Naya, Puerto Merizalde, Costa del Pacífico, Departamento Valle, Colombia, 22 Feb 1943, *José Cuatrecasas 14043* (F).

Cotype . Arbolito epífito, hoja craso-coriácea, verde amarillento claro, flor rosada, veneral bosques 5-50 m alt, río Yurumangui, Departamento Valle, Colombia, Costa del Pacífico, 30 Jan 1944, *José Cuatrecasas 15776* (F).

Apparently known only by the two type collections.

3. **Clusia lunanthera** Maguire, Bull. Torrey Club 75: 431-432. 1948.

Terrestrial tree to 12 m, with copious orange-colored latex, branchlets slender, terete; leaf blades 12-20 cm long, oblanceolate to oblanceolate-elliptic, both base and apex acute, chartaceous, primary veins at 30-40° angle; petioles slender, 3-4 cm long; inflorescences 1-3-flowered; staminate flower: sepals 7, the first two decussate, the remainder imbricate, broadly ovate-oblong, to 18 mm long; petals 8, obovate, crimped, crenated or lobed, 6-7 cm long; stamens numerous, ± 100, filaments more or less flattened and prismatic, crassulous, connate at the base, 6-10 mm long; anthers extrorse, subdistal, inflexed, 4-thecate, 1.0-1.5 mm long, dehiscing full length; staminodia central, numerous, prismatic, ca 3 mm long, anantherous, strongly agglutinated; pistillate flowers: sepals 7, similar to those of staminate flowers; petals 8, 4-5 cm long; staminodia numerous, 2-3-seriate, prismatic at base, prismatic and clavate distally, connate to ½ lenght, forming a distinct cup; ovary 8-locular, ovules numerous, stigmas 8, forming umbraculiform body; mature fruit not seen.

TYPE. Tree to 12 m high, 15 cm diam, latex orange, copious, petals totally white, the flower 8-10 cm diam, frequent, high bush about rim of Arrowhead Basin, Tafelberg, Suriname, 20 Aug 1944, *Bassett Maguire 24422* ♂ (holotype NY).

Distribution. Known only from Tafelberg. SURINAME. Tafelberg: high bush about rim of Arrowhead Basin, 20 Aug 1944, *Maguire 24422* ♂ (holotype NY); high bush about rim of Arrowhead Basin, 20 Aug 1944, *Maguire 24428* ♀; tree 10 m tall, leaves large, elliptic-oblanceolate, petioled flowers 8-10 cm diam, immature fruit elongate, frequent, *Clusia* bush 1 km east Savanna VIII, 29 Aug 1944, *Maguire 24546* ♀; leaves petioled, elliptic-oblanceolate, flowers and bracts totally white, fruit flask-shaped, frequent, east escarpment, 2 km south of East Ridge, 1 Sept 1944, *Maguire 24586* ♀.

4. **Clusia cochlitheca** Maguire, Mem. N. Y. Bot. Gard. 10 (1): 61. 1958.

Tree to 30 m high, 50 cm diam, with cream-colored latex; branchlets acutely angled; petioles thick, 4-5 mm broad, 1.5-3.0 cm long; leaf blades large, strongly chartaceous, elliptic-oblanceolate, commonly 15-25 cm long, 8-12 cm broad, the apex obtuse or acutish, lateral veins at 20-25° angle; inflorescences 1-3-flowered; staminate flowers: sepals 8, with two lower decussate pairs and the upper imbricate, broadly scarious-margined, orbicular-oblong to oblong-oblanceolate, 16-20 mm broad, 20-26 mm long, petals 8, obovate-lanceolate, somewhat panduriform, 3-4 cm broad, 3-6 cm long, white; stamens numerous, 75-100, 3-5-seriate, disposed in a ring 1.0-1.5 mm high; filaments compressed at the base, ca 8-10 mm long; anthers extrorse, cochlearform, 1.5-1.8 mm long, 4-thecate, strongly recurved; staminodia aggregated in a central mass 7-10 mm diam, 1.0-1.5 mm high; pistillate flowers: sepals 8-10; petals 8; staminodes 1-2-seriate, anantherous, connate in a thin corona 4-5 mm high; ovary 8-locular; ovules numerous; stigmas 8, sessile, umbraculiform, cuneate, ca 5-7 mm long; mature fruit not seen.

TYPE. Tree 20 m high, 40 cm diam, cymes 1-3-flowered, sepals white or pinkish, petals 8, wholly white, anthers white, frequent in upper montane woodland at 1.300 m alt, Cerro Huachamacari, Territorio Amazonas, Venezuela, 4 Dec 1950, *Bassett Maguire, Richard S. Cowan & John J. Wurdack 29832* ♂ (holotype NY).

Distribution. Moderate-sized trees apparently confined to the montane forests of the Cerros Parú, Huachamacari, and Neblina of Territorio Amazonas, Venezuela. VENEZUELA. Territorio Amazonas, Cerro Huachamacari: tree 30 m high, 50 cm diam, at 1.300 m. alt, 4 Dec 1950, *Maguire, Cowan & Wurdack 29831* ♀; 1.300 m alt, 4 Dec 1950, *Maguire, Cowan & Wurdack 29832* ♂ (holotype NY); small tree at 1.200 m alt, 5 Dec 1950, *Maguire,* *Cowan & Wurdack 29864* ♀; tree 20 m high, 1.000 m alt, 20-21 Dec 1950, *Maguire, Cowan & Wurdack 29965* ♀; tree 10 m high, 1.800 m alt, 13 Dec 1950, *Maguire, Cowan & Wurdack 30185* ♀. Cerro Parú: tree 7 m high, occasional at 2.000 m alt, 31 Jan 1951, *Cowan & Wurdack 31073* ♂. Cerro de la Neblina: ♀ rambling tree to 15 m, latex pale oxidizing brownish-yellow, stigmas 8, flat, rimose, frequent in *Clusia* "moss forest" just south of Camp 3, 650-700 m alt, 23 Dec 1953, *Maguire, Wurdack & Bunting 36813;* ♀ (flowering material of 36813), sepals and petals totally white, petals 8, styles umbiliciform, frequent in *Clusia* "moss forest" just south of Camp 3, 650-700 m elev, 23 Dec 1953, *Maguire, Wurdack & Bunting 36814;* ♂ of 36813, just south of Camp 3, 650-700 m elev, 23 Dec 1953, *Maguire, Wurdack & Bunting 36818;* ♀, scandent tree 8 m high, latex pale oxidizing brownish, stigmas 8, in high montane forest 2-8 km south of Camp 3, 900 m elev, 24 Dec 1953, *Maguire, Wurdack & Bunting 36880;* ♀ (= 36813), 2-3 km south of Camp 3, 700-800 m alt, 26 Dec 1953, *Maguire, Wurdack & Bunting 36896;* ♂ (= 36818), frequent in *Clusia* "moss forest" 2-3 km south of Camp 3, 700-800 m elev, 26 Dec 1953, *Maguire, Wurdack & Bunting 36900;* ♂ sprawling tree 8 m high, latex milky, moderate, buds pink, petals white, occasional in *Clusia* tangle just south of Camp 3, 700 m elev, 14-16 Nov 1957, *Maguire, Wurdack & Maguire 42075;* ♀ of *42075*, sprawling tree 8 m high, latex milky, moderate, petals white, staminodia yellow, stigma green, 8-lobed, occasional in *Clusia* tangle just south of Camp 3, 700 m elev, 14-16 Nov 1957, *Maguire, Wurdack & Maguire 42078;* in talus forest between Camps 3 and 4, 700-1.300 m elev, 1 Jan 1958, *Maguire, Wurdack & Maguire 42580* ♂.

More closely related to *Clusia lunanthera,* known only from Tafelberg, Suriname, and differing from that species by the sharply angled stems, commonly larger obtusish leaves, the lower 4 sepals decussate, panduriform petals, and cream-white latex, which attributes in the former are: terete stems, smaller more acute leaves, the lower pair of sepals only decussate, obovate smaller petals, and orange-colored latex.

5. **Clusia orthoneura** Standley, Field Mus. Publ. Bot. 22: 91. 1940.

Medium-sized tree to 18 m high, often large epiphytes; branchlets slender; latex moderate, white; petioles 8-20 mm long, slender, narrowly margined; leaf blades subcoriaceous, elliptic to elliptic-oblong, apex acute to obtusish, base acute, lateral veins at angles of 75-80° and distally parallel; inflorescence terminal, cymose, 1-3-flowered; staminate flowers: sepals (2-) 3 pairs, decussate, the outer subpetaloid, broadly orbicular-obovate, to 3 cm long; petals 5-7, oblong-obovate, 3-4 cm long, white, rose-maculate; androphore prominent, 8-10 mm high, 12-15 mm broad, pentagonal-conic, somewhat scalloped at the summit; stamens ca 20 or fewer, commonly 2-seriate, filaments stout, terete, ca 1 cm long, outwardly curved; anthers extrorse, 4-celled, strongly cochlearform, ca 3.5 mm long; pistillate flowers: sepals 3 pairs, decussate, petals 5 (-7), oblong-obovate, ca 2.5-3.5 cm long; staminodia forming a fleshy scalloped corona 6-8 mm high and 2.5 mm thick; ovary 6-carpellate, ovules numerous, axillary; fruit somewhat ovate to somewhat obovate, 7-8 cm long, 5-6 cm broad, somewhat 6-angled; stigmas 6, sessile, acutely obovate, ca 7-8 mm long, subconnivent; seed oblong, 5-6 mm long, punctate; embryo erect, cotyledons small, hemispheric, ca 0.5 mm long.

TYPE. Epiphytic tree 40-60 ft high, 2-3 inches diam, petals pinkish-white, stamens yellow, a very sticky substance collected at base; at 3.500 ft alt, Mt. Chapon, NW Bogotá, extreme western part of Department Boyacá, Colombia, 2 Jun 1932, *A. E. Lawrance 131* (F).

Distribution. Trees or large epiphytes on open hillsides and pastures at 1.200-1.800 meters. COLOMBIA. Departamento Boyacá: tree, petals pinkish-white, forest above Pandi at 1.800-2.000 m alt, 1-3 Dec 1918, *Pennell 2824* (NY); 2 Jun 1932, *Lawrance 131* (isotypes K, NY). Departamento Cundinamarca: árbol 5 m, ♂, muy ramificado, cáliz verde con manchas rojas, pétalos rosados; latex amarillo; río Dulce, Sasaima, vereda de San Bernardo, carretera a Las Mercedes, 1.200-1.400 m alt, 6 Jan 1970, *García-Barriga 20022* (COL, NY); "Caucho", arbolito ♂ de 3 m, muy ramificado, flores rojizas, Sasaima, vereda de San Bernardo, carretera a Las Mercedes, 1.200-1.400 m alt, 6 Jan 1970, *García-Barriga 20034* (COL, NY); bushy tree to 5 m, ♂, latex moderate, white, attitude of leaves erect, buds and flowers reflected, at 1.800 m alt, 2 km from highway below Sasaima-San Bernardo, on road from Bogotá, 31 Oct 1970, *Maguire, Maguire & Blanco 62204* (COL, NY); bushy tree to 5 m, ♂, latex moderate, white, attitude of leaves erect, buds and flowers reflected, at 1.800 m alt, 2 km from highway, below Sasaima-San Bernardo on road from Bogotá, 31 Oct 1970, *Maguire, Maguire & Blanco 62205* (COL, NY); epiphyte, ♀, latex moderate, white, 1.800 m alt, data as preceding, 31 Oct 1970, *Maguire, Maguire & Blanco 62206* (unicate NY); massive branched epiphyte, ♀, latex moderate, white, petals 6-7, rose-maculate, sepals 6, decussate, buds rose, fruit oblong, elliptic-ovate, somewhat 6-angled, carpels 6, to 12 cm long, to 6.5 cm wide, data as preceding, 31 Oct 1970, *Maguire, Maguire & Blanco 62207* (COL, NY); massive branched epiphyte, ♀, latex moderate, white, petals 6-7, rose-maculate, sepals 6, decussate, buds rose, fruit oblong, elliptic-ovate, somewhat 6-angled, to 12 cm long, to 6.5 cm wide, data as preceding, 31 Oct 1970, *Maguire, Maguire & Blanco 62208* (COL, NY); massive branched epiphyte, ♀, latex moderate, white, petals 6-7, rose-maculate, sepals 6, decussate, buds rose, fruit oblong, elliptic-ovate, somewhat 6-angled, carpels 6, data as preceding, 31 Oct 1970, *Maguire, Maguire & Blanco 62209* (COL, NY); massive branched epiphyte, ♂, latex moderate, white, buds rose, sepals 3 pairs, decussate, petals 5, 6, 7, at 1.800 m alt, data as preceding, 31 Oct 1970, *Maguire, Maguire & Blanco 62210* (COL, NY);

Jardín La Clarita, 1.700 m alt, Fusagasugá, Cordillera Oriental, 5 Dec 1970, *Idrobo 6326* (COL, NY).

Clusia orthoneura, becoming the type of the subsection, together with the following, *C. celiae* and *C. cochliformis,* are distinctive in the formation of the prominent, fleshy, conic or coroniform androphore. The three species are confined to a limited geographic range in the Departments of Cundinamarca, Boyacá, Santander and Norte de Santander.

6. **Clusia celiae** Maguire sp nov.

A sectione Cochlantherae affinis.

Arbor mediocris ad 15 m alta; latice albido, copioso; ramulis teretibus, crassis, subsucculentis, 8-12 mm diam; foliis appositis, petiolatis; petiolis 12-15 mm longis, latis, aliquantum alatis; laminis subcoriaceis, late obovatis, 12-20 cm longis, 9-17 cm latis, apice latirotundato, basi acuminata; costa late conspicua, ad 5 mm lata, supra medio excedenti; venis lateralibus adscendentibus angulo 45°, vulgo 3-4 mm apartis, nervo marginali inconspicuo, in laminis juvenalibus canalibus laticibus conspicuis; inflorescentiis terminalibus; floribus masculinis 1-3, pedunculis vulgo recurvatis, 6-8 cm longis; bracteis orbicularibus, 12-15 mm longis, praecox caducis; alabastris ad 2.5 mm longis, pellucido-albidis; sepalis 2 jugis inferioribus, primis concavis, chartaceis, late scariomarginatis, ad 12 mm longis, secundis petaloideis, ad 25 mm longis, tertiis plus minusve decussatis, quartis-sextis vel septimis imbricatis, petaloideis, 25-28 mm longis, interioribus vittatis; petalis 5-6, imbricatis, ceraceo-virgineis, latissime obovatis, subcrispatis, multivenatis, 5-6 cm longis, 7-8 cm latis; androphoro 1.5 cm alto, 2 cm lato, conico 5-angulato, staminibus 30-40, 3-serialibus; filamentis exterioribus subsessilibus, filamentis interioribus ca 10 mm longis, 2 mm crassis, intra affixis; antheris extrorsis, valde recurvatis, in longitudine toto ca 6 mm, 4-thecatis, longitudine dehiscentibus; granis pollinis ca 30 μ diam, sphaeroideis, tricolporatis, colpis et poris prominentibus, sporodermate foveolato; floribus foemineis mihi ignotis; capsulis succulentis valde lactiferis, elliptico-globosis, 6.5-7.5 cm longis, 5.5-6.5 cm latis, stigmatibus 5, brevicornutis, discoideis, ca 6-7 mm diam; staminodiis squamis in corona dispositis; ovario 5-loculari; ovulis numerosis, placentatione infra axiali, supra placentatione dissepimentorum parietali affixis; seminibus oblongo-ovalis, 6-7 mm longis, ca 3 mm latis; embryone immaturo solo visi.

TYPE. Rounded ♂ tree 8 m high, wood soft, branchlets subsucculent, leaf scars persistent, extending half the diameter of older trunks; latex white, copious; calyx of 8 sepals with 2 lower pairs decussate, the second white, petaloid, third-sixth imbricate, petaloid, white-hyaline; petals 5-6, waxy white, much broader than long; frequent on open hillsides 32 km south of Bucaramanga, road to San Gil, 1.150 m alt, Santander, Colombia, 4 Oct 1970, *Bassett Maguire & Celia K. Maguire 62132* ♂ (holotype NY).

Distribution. Observed only along the Bucaramanga-Piedecuesta-San Gil, highway, Santander, Colombia, frequent on open slopes, a rounded tree to 15 m high, of high ornamental quality.

COLOMBIA. Santander, Bucaramanga-San Gil highway: tree 8 m high, highly ornamental, flowers abundant, large, white, km 32, 3 Oct 1970, *Maguire & Maguire 62128* ♂ (COL, NY, VEN); same data, km 33, *Maguire & Maguire 62129* ♂ (COL, NY, US); tree 12 m high, fruit large, solitary, terminal, globose, 5-celled, stigmas short cornute, km 32, 3 Oct 1970, *Maguire & Maguire 62130* ♀ (COL, NY, US, VEN, K, S); short distance south of Piedecuesta, 1.150 m alt, 4 Oct 1970, *Maguire & Maguire 62132* ♂ (holotype NY, isotypes COL, NY, VEN, US, MO, F, S, K); tree 10 m, type station, *Maguire & Maguire 62133* ♀ (COL, NY, US); rounded tree to 10 m, flowers showy, white, 2-3 km S Socorro, 1.250 m alt, 24 Nov 1970, *Maguire & Maguire 62290-A* (unicate); same data, *Maguire & Maguire 62290-B* (unicate).

This extraordinarily ornamental tree seems to be locally endemic to central Santander between Bucaramanga and San Gil. It becomes the sixth member of the section *Cochlanthera,* characterized by cochlearform extrorse anthers. It gives me much pleasure to name this beautiful *Clusia* for its co-collector, my wife, Celia K. Maguire.

7. **Clusia cochliformis** Maguire, sp nov.

A sectione Cochlantherae affinis.

Arbor parva ad 15 m alta, cum latice albo copioso; ramulis teretibus; foliis oppositis, petiolatis, petiolis non-vel-anguste-alatis, 1-2 cm longis; laminis chartaceis vel subcoriaceis, oblanceolatis, vulgo 12-15 cm longis, 5-9 cm latis, apice rotundato, basi acuminata, costa angusta, ¾ apicis excedenti, venis a 50-60° angulis, 2-3 mm apartis; inflorescentiis terminalibus, 1-3-floribus; floribus masculinis: sepalis 3-jugis, decussatis, inferioribus late rotundatis, ca 12 mm latis, 10 mm longis, superioribus orbiculari-oblongis, ca 3 cm longis, late scario-marginatis; petalis 6, imbricatis, late obovatis, ca 4 cm longis, 5 cm latis, albidis, multivenatis, marginibus subcrispatis; androphoro depresso-globoso, ca 8 mm alto, 12 mm lato, 5-angulato; staminibus 20-22 in 2-serialibus affixis; filamentis crassis, ca 5 mm longis, ad bases aliquantum confluentibus; antheris extrorsis valde recurvatis, in longitudine toto 1.5-2.0 mm; granis pollinis ca 30 μ diam, sphaeroideis, tricolporatis, colpis et poris prominentibus, sporodermate laevi, minute punctulato; floribus foemineis mihi ignotis; capsulis succulentis valde lactiferis, elliptico-oblongis vulgo 6 cm longis, 3.5-4.0 cm latis, stigmatibus 5, sessilibus, discoideis, ca 3 mm diam; staminodiis squamis in corona basali dispositis; ovario 5-loculari, ovulis numerosis, placentatione axillari-septato; seminibus numerosis, oblongo-ovalibus, ca 5 mm longis, 3 mm latis, testa laevi; embryone erecto, cotyledonibus minutis, plumula minuta; endospermio involventi magno.

TYPE. Tree 8 m high with ample white latex; petals 6, showy, white, frequent in open areas, frequent 3 km west of Río de Oro, at 1.225 m alt, Santander del Norte, Colombia, 25 Nov 1970, *Bassett Maguire & Celia K. Maguire 62302* ♂ (holotype NY).

Distribution. Trees to 15 m high, known only from open slopes and valley bottoms, 1.200-1.500 m alt, Santander del Norte. COLOMBIA, Santander del Norte: tree 7 m high, latex white, ample, 7 km west of Río de Oro at 1.450 m alt, 25 Nov 1970, *Maguire & Maguire 62300* ♀ (COL, NY, VEN, US, K, S, MO); tree 8 m high with ample white latex, flowers showy, petals 6, white, in open places, frequent, 3 km west of Río de Oro, 1.225 m alt, *Maguire & Maguire 62302* ♂ (holotype NY, isotypes COL, VEN, US); trees to 15 m, latex white, ample, abundant in thickets and pastures, 7 km from Ocaña on Cúcuta road, at 1.210 m alt, 26 Nov 1970, *Maguire & Maguire 62303* ♀ (NY, COL, US); tree 8 m high, latex cream, moderate, frequent in thickets and pastures, 7 km from Ocaña on Cúcuta road at 1375 m alt, 26 Nov 1970, *Maguire & Maguire 62306* ♀ (COL, NY, MO, K, S); tree 15 m high, 30 cm diam, latex cream-white, ample, flowers showy, petals 6, white, occasional in open places at 1.400 m alt, km 53 beyond Ocaña on Cúcuta road, 26 Nov 1970, vernacular name "Rampacho", *Maguire & Maguire 62307* ♂ (COL, NY, S, K, MO).

Clusia cochliformis is closely related to *C. celiae*, but is distinctive from the latter by different form and texture of leaves, fewer decussate (3 pairs) sepals, smaller petals, stamens fewer, 2-ranked, fruit more narrowly oblong, and non-cornute, sessile, small, proximal stigmas. The two species occupy small discrete ranges, that of *C. celiae* in Department Santander, and that of *C. cochliformis* in Department Santander del Norte.

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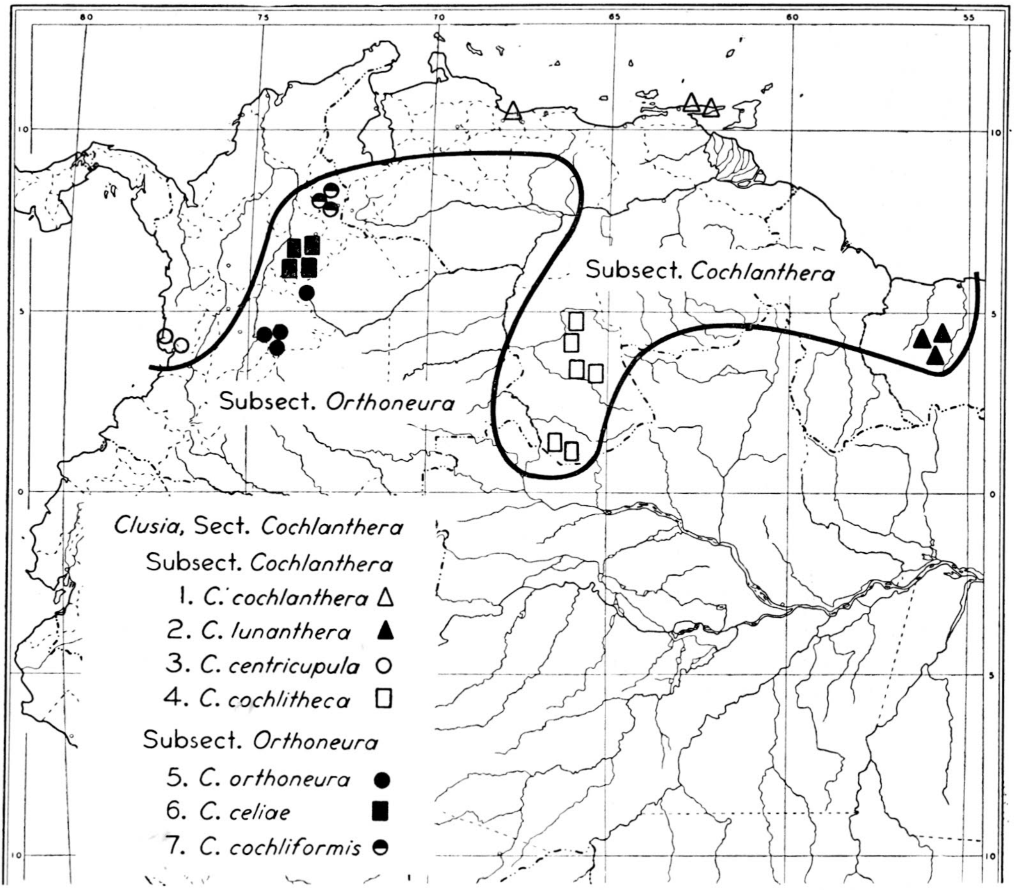
80
75
70
65
60
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10
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5
10
Subsect. Cochlanthera
Subsect. Orthoneura
Clusia, Sect. Cochlanthera
Subsect. Cochlanthera
1. C. cochlanthera △
2. C. lunanthera ▲
3. C. centricupula ○
4. C. cochlitheca □
Subsect. Orthoneura
5. C. orthoneura ●
6. C. celiae ■
7. C. cochliformis ⊖

FIGURE 1. Map showing distribution of the species of *Clusia* L. Section *Cochlanthera*.

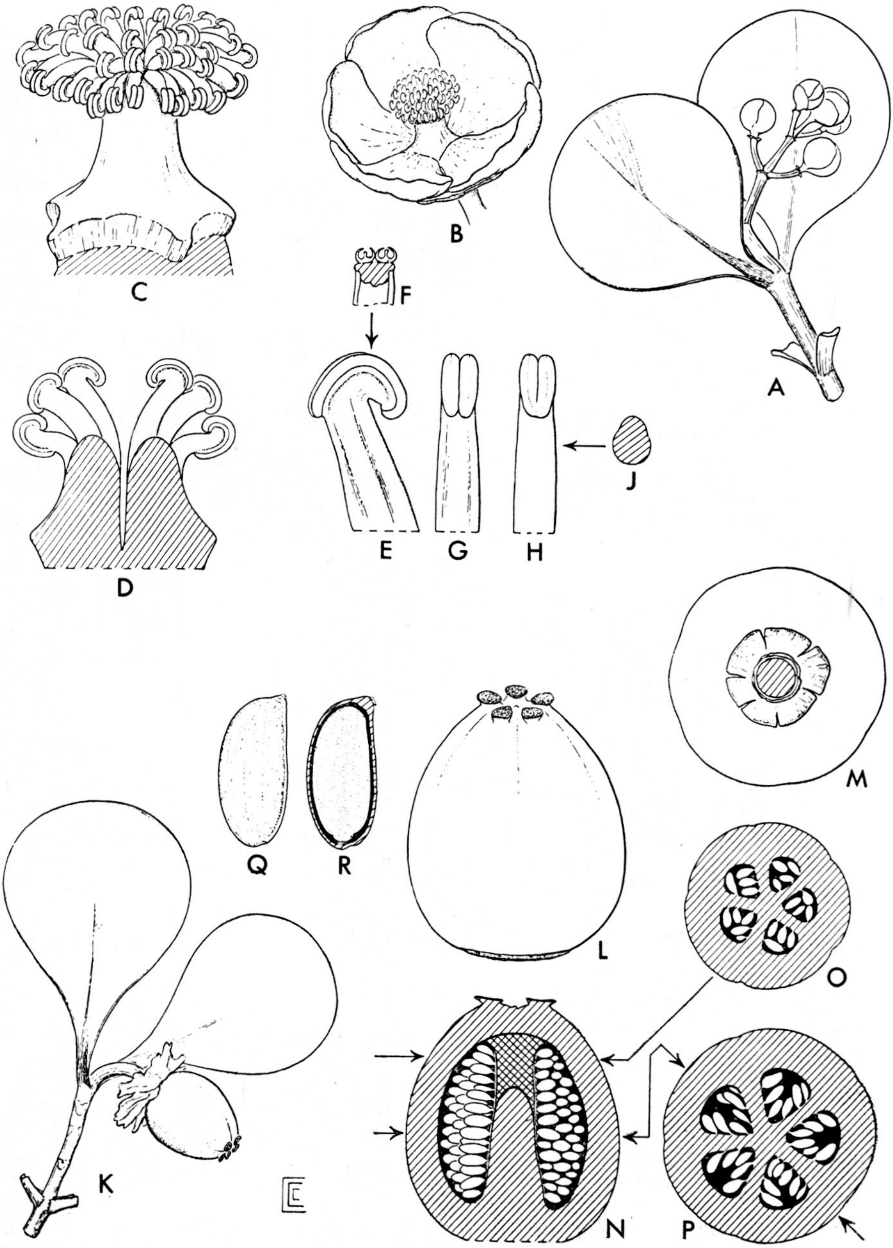

FIGURE 2. *Clusia celiae* Maguire. A-J, ♀. A. Habit, X ¼ *(Maguire & Maguire 62290-B)*. B. Male flower, X ½ *(Maguire & Maguire 62132)*. C. Androecium, X 1½ *(Maguire & Maguire 62128)*. D. Androecium in vertical median section, X 1½ *(Maguire & Maguire 62128)*. E-J. Stamen, X 3 *(Maguire & Maguire 62128)*: E. Lateral view; F. Cross-section, anther and connective; G. Dorsal view; H. Ventral view; J. Cross-section of filament. K-R. ♀. K. Habit, X ¼ *(Maguire & Maguire 62133)*. L. Fruit, X ½ *(Maguire & Maguire 62130)*. M. Staminodial corona from below, X ½ *(Maguire & Maguire 62130)*. N. Fruit, vertical median section, X ½ *(Maguire & Maguire 62130)*, note distally shortened central axis. O. Fruit, cross-section, distal level, X ½ *(Maguire & Maguire 62130)*, note ovule attachment to dissepiment, not to central axis. P. Median section, X ½ *(Maguire & Maguire 62130)*. Q. Seed, X 3 *(Maguire & Maguire 62130)*. R. Seed, long section, X 3 *(Maguire & Maguire 62130)*.

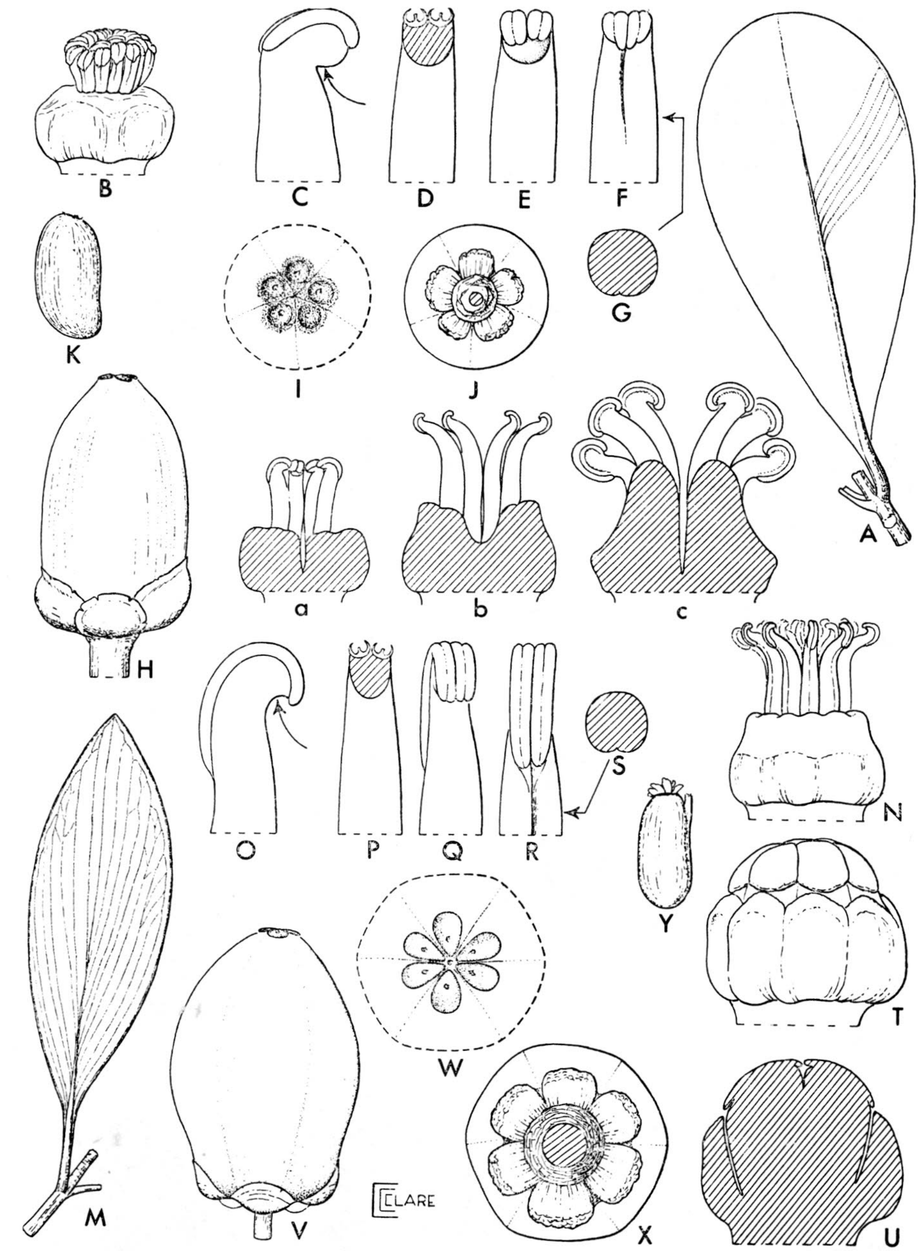

FIGURE 3. *Clusia cochliformis* Maguire. A. Leaf, X ½ (*Maguire & Maguire 62302*). B-G. *Maguire & Maguire 62307*, ♂. B. Habit, androecium, X 1-½; C-G. Stamen, X 6: C. Lateral view; D. Showing section through anther; D. Ventral aspect; E. Dorsal aspect; G. Cross-section of filament. H-L. *Maguire & Maguire 62300*, ♀: H. Fruit, X ½; I. Stigma, distal view, X 1; J. Staminodial corona, basal view, X 1; K. Seed, X 3.

a-c. Comparative diagrammatic sections of androecium, X 1-½: a. *Clusia cochliformis;* b. *Clusia orthoneura;* c. *Clusia celiae.*

Clusia orthoneura, M-Y. M-S, *Maguire & Maguire 62205* ♂; T-V, Y, *Maguire & Maguire 62208* ♀; W-X, *Maguire & Maguire 62209* ♀. M. Leaf, X ½; N. Androecium, X 1½; O. Stamen, lateral view, X 6 (arrow indicates location of section in P); P. Section through anther, X 6; Q. Ventral view of anther, X 6; R. Dorsal view of anther, X 6; S. Cross-section of filament, X 6; T. Gynoecium, X 2; U. Gynoecium, vertical median section, X 2; V. Fruit, X ½; W. Stigmas, distal view, X 1; X. Staminodial corona, basal views, X ½; Y. Seed, X 3.

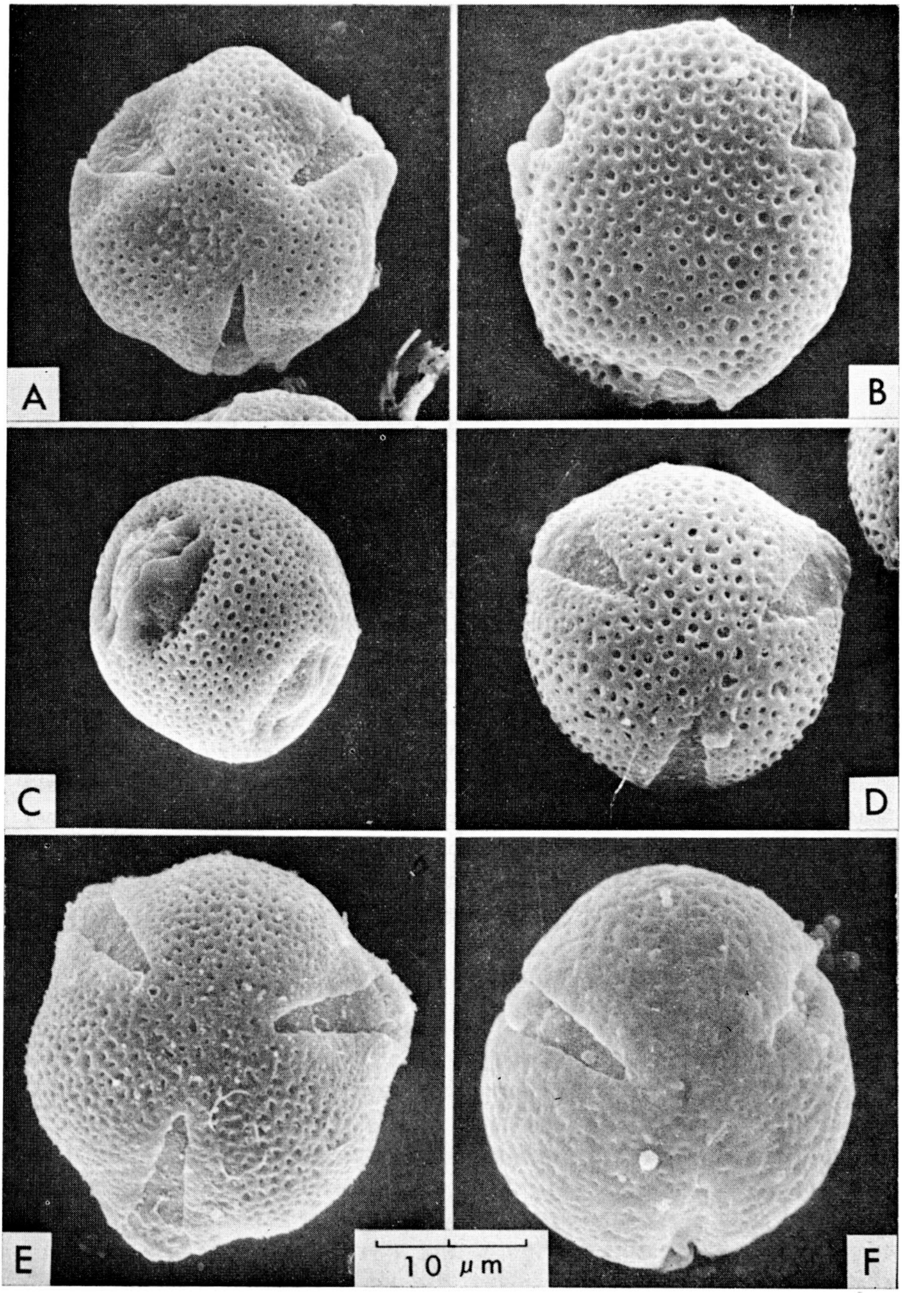

FIGURE 4. SEM micrographs, all enlarged about 3.000 X: A. *C. cochlanthera,* polar view; B. *C. lunanthera,* polar view; C. *cochlitheca,* oblique intersulcar view; D. *C. orthoneura,* polar view; E. *C. celiae,* polar view; F. *C. cochliformis,* polar view. Note that the sulci are of various lengths, long in A, D, E and F; short in B, and in E hardly extended beyond the periphery of the pores. The exines of all are foveolate except that of *C. cochliformis* which is psilate and minutely punctitegillate.